

Intraoperative diagnosis and endoscopic management of iatrogenic common bile duct injury during laparoscopic cholecystectomy: A case report

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ABSTRACT

Although laparoscopic cholecystectomy (LC) is considered the gold standard treatment for symptomatic gallstone disease, iatrogenic bile duct injury remains a rare but serious complication. We present a case of a Strasberg type D bile duct injury that was diagnosed intraoperatively and successfully managed with endoscopic retrograde cholangiopancreatography (ERCP) during the same session, and we discuss it in light of the current literature. A 46-year-old female patient underwent LC for a hydropic and edematous gallbladder. During difficult dissection, a bile leak was observed from the posterior wall of the common hepatic duct, consistent with a Strasberg type D injury. The endoscopy team was consulted intraoperatively, and ERCP was performed. Cholangiography confirmed the leak, and a plastic stent was placed from the common hepatic duct to the ampulla. The operation was completed with drainage of the subhepatic area. Postoperatively, the patient remained clinically stable. At the sixth postoperative week, follow-up ERCP revealed complete healing with no evidence of leakage, and the stent was removed. The patient had an uneventful recovery, with normal biochemical parameters on follow-up. Early recognition of iatrogenic bile duct injury is the most critical factor influencing prognosis. The literature reports intraoperative detection rates between 25% and 32%, whereas delayed diagnosis is associated with higher morbidity, additional surgical interventions, and prolonged hospital stay. Endoscopic management, particularly in Strasberg type C and type D injuries where ductal continuity is preserved, has shown high success rates (89–96%) and represents a reliable alternative to surgery. This case highlights that multidisciplinary collaboration and intraoperative endoscopic intervention provide a minimally invasive and effective option for the management of bile duct injuries during LC.

Keywords: Laparoscopic cholecystectomy; Strasberg type D; bile duct injury; endoscopic retrograde cholangiopancreatography (ERCP); intraoperative management.

INTRODUCTION

Laparoscopic cholecystectomy (LC) is widely regarded as the gold standard treatment for symptomatic gallstone disease and remains one of the most frequently performed surgical procedures worldwide.^[1] Despite its minimally invasive nature, one of the most serious complications associated with LC is iatrogenic bile duct injury (BDI).^[2] The incidence of iatrogenic common bile duct injury has been reported to range between 0.3% and 0.7%.^[3,4]

Timely recognition of intraoperative complications and their management with minimally invasive techniques during the same session can significantly improve patient outcomes.^[5] Factors that increase the risk of BDI include anatomical variations, severe inflammation, fibrosis, and adhesions from previous surgeries. The most common underlying cause, however, is misidentification of the biliary anatomy. Furthermore, the surgeon's level of experience and the chosen dissection technique directly influence the likelihood of injury.^[6]

The Strasberg classification is the most widely used system

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for defining these injuries and guiding appropriate treatment strategies.^[7] Type D injuries, in particular, are characterized by partial defects in the bile duct wall while preserving ductal continuity, making them suitable for endoscopic management. In such cases, endoscopic sphincterotomy and stent placement can achieve successful outcomes.^[6,8]

Recent evidence emphasizes that early intraoperative recognition combined with minimally invasive management markedly improves long-term prognosis. Within this framework, endoscopic retrograde cholangiopancreatography (ERCP) with stent placement has emerged as a safe and effective alternative to surgery, especially in Strasberg type C and type D injuries.^[9,10]

Herein, we report a case of a Strasberg type D iatrogenic common bile duct injury identified intraoperatively during LC and successfully managed with ERCP in the same session, and we review the case in the context of the current literature.

CASE REPORT

A 46-year-old female patient presented with right upper quadrant pain and dyspeptic complaints. Ultrasonography and magnetic resonance cholangiopancreatography (MRCP) performed at an outside institution revealed a hydropic gallbladder with wall thickening. Preoperative biochemical tests were within normal limits.

For this case report, written informed consent was obtained from the patient during the treatment process for participation in the study, as well as for the publication of any potentially identifiable clinical data and images included in the manuscript.

The patient underwent laparoscopic cholecystectomy under general anesthesia using the standard four-port technique. Intraoperatively, the gallbladder was noted to be markedly edematous and hydropic. As the gallbladder could not be manipulated adequately with laparoscopic instruments, decompression with a Veress needle was performed, aspirating 40 mL of infected biliary fluid. Dissection was then initiated by elevating the gallbladder from Hartmann's pouch.

During dissection, bile leakage was observed from the posterior wall of the common hepatic duct, consistent with a Strasberg type D injury (Fig. 1). The endoscopy team was immediately consulted, and intraoperative ERCP was performed. Cholangiography confirmed the bile leak (Fig. 2). A plastic stent was placed from the common hepatic duct to the ampulla, and subsequent control cholangiography demonstrated no further extravasation (Fig. 3). Laparoscopic cholecystectomy was then completed, and a drain was placed in the subhepatic space.

The postoperative course was uneventful, and the patient remained clinically stable. At six weeks, follow-up biochemical tests were normal, and ERCP confirmed complete healing of the injury with no evidence of bile leakage; the stent was re-

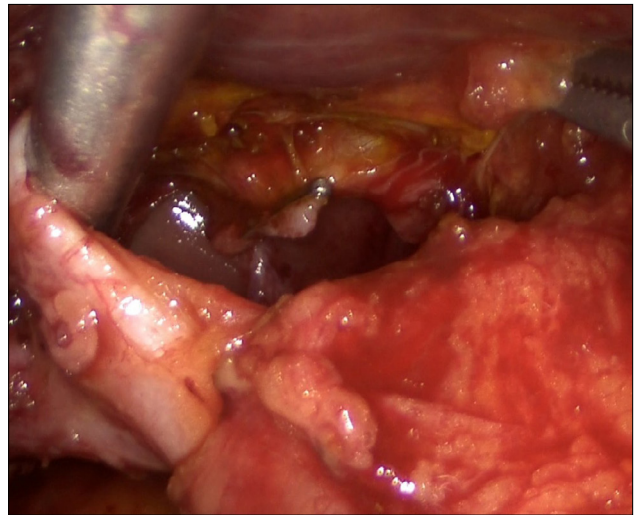


Figure 1. Intraoperative laparoscopic view demonstrating a Strasberg type D iatrogenic bile duct injury. During difficult dissection in laparoscopic cholecystectomy for a hydropic and edematous gallbladder, a partial defect with bile leakage was observed on the posterior wall of the common hepatic duct.

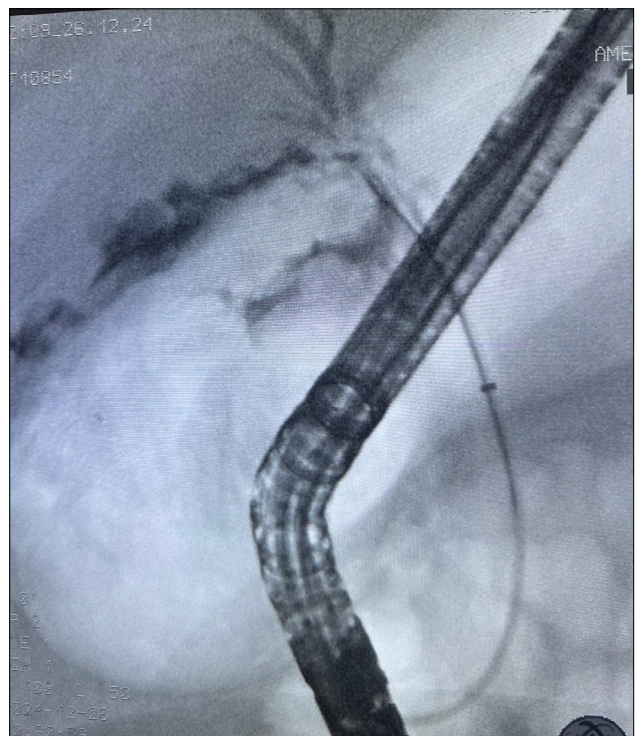


Figure 2. Intraoperative endoscopic retrograde cholangiopancreatography (ERCP) image demonstrating cholangiographic findings. Contrast extravasation is visible from the posterior wall of the common hepatic duct, confirming a Strasberg type D bile duct injury during laparoscopic cholecystectomy.

moved accordingly (Fig. 4). The patient was discharged without complications. At the fourth and eighth postoperative months, biochemical parameters and physical examinations remained normal, with no evidence of late complications.



Figure 3. Intraoperative endoscopic retrograde cholangiopancreatography (ERCP) image during stent placement. A plastic biliary stent was introduced through the common bile duct into the duodenum following identification of a Strasberg type D injury, providing internal biliary drainage.



Figure 4. Follow-up endoscopic retrograde cholangiopancreatography (ERCP) image performed at 6 weeks after stent removal. Control cholangiography demonstrates normal opacification of the biliary tree without evidence of contrast extravasation, confirming complete healing of the Strasberg type D bile duct injury.

DISCUSSION

Although the incidence of iatrogenic bile duct injury during laparoscopic cholecystectomy is low, such injuries have a significant impact on patient morbidity and mortality. The most common causes are difficult dissection due to severe inflammation, edema, or anatomical variations.^[2,9] In our case, dissection was challenging because of a markedly hydroptic and edematous gallbladder, resulting in a Strasberg type D injury on the posterior wall of the common hepatic duct.

Recognition of bile duct injuries during the intraoperative period is the most critical factor influencing prognosis. The rate of intraoperative detection is reported to be approximately 25-32% in the literature.^[2] Delayed diagnosis is associated with higher complication rates, the need for additional surgical interventions, and prolonged hospital stays.^[11,12] In our patient, the injury was promptly identified intraoperatively, which was possible due to a low threshold of suspicion, and was managed successfully in the same session.

Endoscopic therapy represents a safe and effective option, particularly for Strasberg type C and type D injuries where bile duct continuity is preserved.^[9,10,13] Recent studies have reported success rates of 89-96% with endoscopic sphincterotomy and stent placement.^[14,15] Similarly, in our case, ERCP with plastic stent placement was performed intraoperatively, and follow-up ERCP at six weeks demonstrated complete healing with uneventful stent removal. This outcome is consistent with the high success rates reported in the literature.

The surgeon's experience, dissection technique, and a multidisciplinary approach are essential elements in the management of bile duct injuries.^[16,17] Alternative strategies, such as the fundus-first or subtotal cholecystectomy techniques, may improve safety in difficult cases, but they do not completely eliminate the risk of injury, especially in the presence of severe inflammation.^[18] Therefore, meticulous intraoperative observation by the surgeon and close coordination with the endoscopy team are critical for early recognition and successful treatment.

In conclusion, this case demonstrates that a Strasberg type D bile duct injury occurring during LC can be diagnosed intraoperatively and managed successfully with endoscopic stenting in the same session. Consistent with the current literature, early recognition, minimally invasive approaches, and multidisciplinary teamwork are indispensable for achieving optimal patient outcomes.

CONCLUSION

Iatrogenic bile duct injury remains one of the most challenging complications of laparoscopic cholecystectomy, with a significant impact on patient outcomes despite its low incidence. Early intraoperative recognition of these injuries is the most critical factor in reducing morbidity and preventing further interventions. Our case highlights that a Strasberg type D bile duct injury, when promptly identified, can be successfully managed with endoscopic stenting during the same operative

session. This minimally invasive approach provided complete healing without complications and avoided the need for additional surgery. In line with current evidence, early diagnosis, timely endoscopic intervention, and multidisciplinary collaboration are essential for optimizing outcomes in patients with iatrogenic bile duct injury.

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OLGU SUNUMU - ÖZ

Laparoskopik kolesistektomi sırasında gelişen iatrojenik koledok yaralanmasının intraoperatif tanısı ve endoskopik tedavisi: Bir olgu sunumu

Laparoskopik kolesistektomi (LK), semptomatik safra taşı hastalığının tedavisinde altın standart olarak kabul edilse de, iatrojenik safra yolu yaralanmaları nadir fakat ciddi komplikasyonlar arasında yer almaktadır. Bu çalışmada, Strasberg Tip D koledok yaralanmasının intraoperatif tanısı ve aynı seansta endoskopik retrograd kolanjiyopankreatografi (ERCP) ile başarılı tedavisi sunulmakta ve literatür eşliğinde tartışılmaktadır. Kırk altı yaşındaki kadın hasta, hidropik ve ödemli safra kesesi nedeniyle LK'ye alındı. Zorlu disseksiyon sırasında ana hepatik kanalın posterior duvarında safra kaçağı izlendi ve Strasberg Tip D yaralanma tanımlandı. İntraoperatif dönemde endoskopi ekibi çağrılarak ERCP uygulandı. Kolanjiyografide kaçak doğrulandı ve hepatik kanaldan ampullaya plastik stent yerleştirildi. Operasyon tamamlanarak subhepatik alana dren kondu. Postoperatif dönemde hasta stabil seyir gösterdi. Altıncı haftada yapılan kontrol ERCP'de kaçığın tamamen iyileştiği görüldü ve stent çıkarıldı. Takiplerde komplikasyon gelişmedi ve biyokimyasal parametreler normal seyretti. İatrojenik safra yolu yaralanmalarının erken tanınması hasta prognozunu doğrudan etkileyen en kritik faktördür. Literatürde intraoperatif tanı oranlarının %25–32 arasında olduğu bildirilmekte, gecikmiş tanı ise daha yüksek morbidite, ek cerrahi girişimler ve uzamış hastanede kalış süreleriyle ilişkilendirilmektedir. Özellikle Strasberg Tip C ve Tip D yaralanmalarda endoskopik tedavi, kontinuitenin korunduğu durumlarda yüksek başarı oranları (%89–96) ile güvenilir bir seçenektir. Bu olgu, multidisipliner yaklaşımın ve intraoperatif endoskopik müdahalenin, safra yolu yaralanmalarının yönetiminde cerrahiye alternatif, minimal invaziv ve etkili bir yöntem olduğunu göstermektedir.

Anahtar sözcükler: ERCP; intraoperatif yönetim; laparoskopik kolesistektomi; safra yolu yaralanması; Strasberg Tip D.

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